

2011 ANNUAL REPORT

Evaluation of Mechanical, Biological, and Chemical Treatments to Restore Sagebrush Steppe in Northeastern Utah



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Utah Watershed Restoration Initiative

Cooperative Sagebrush Initiative

Bureau of Land Management

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Introduction

Greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse) once occurred in at least 16 states in the western United States and in three Canadian provinces (Schroeder et al. 1999). Within the range currently occupied by the species, greater sage-grouse population declines have been largely attributed to the loss and/or fragmentation of important sagebrush (*Artemisia* spp.) habitats caused by anthropogenic disturbances (Connelly et al. 2000). Additionally, invasive species such as cheatgrass (*Bromus tectorum*), halogeton (*Halogeton glomeratus*), and western juniper (*Juniperus* spp.) have replaced desirable grasses, forbs, and shrubs. Because of these cumulative conservation concerns, the U.S. Fish and Wildlife Service (USFWS) has designated the species as a candidate for protection under the Endangered Species Act of 1973 (USFWS 2010). Additional research is needed to determine individual and population responses to management actions implemented to mitigate identified conservation threats. This research will evaluate vegetation response and sage-grouse use to site-specific mechanical, biological, and chemical treatments implemented to enhance sagebrush steppe habitat quality for the species. These treatments will be implemented under diverse environmental conditions and different geographical locations in Utah to include Deadman's Bench in Uintah County and Anthro Mountain in Duchesne County.

Study Areas

This research is being conducted on two distinct sites in Utah. The Deadman's Bench site is located in Uintah County southeast of the city of Vernal, near the Colorado border. This is a sagebrush steppe site consisting of public lands managed by the Bureau of Land Management. Traditionally, this land has been used for dormant season grazing by domestic cattle and sheep. In recent years, a natural gas field has been developed. This area supports a remnant sage-grouse population.

The Anthro Mountain site is located within the Ashley National Forest approximately 29 km south of Duchesne, Utah. The site consists primarily of mountain big sagebrush (*A. tridentata vaseyana*), with pockets of quaking aspen (*Populus tremuloides*) and Douglas fir (*Pseudotsuga menziesii*) on north-facing slopes. Smooth brome grass (*B. inermis*) dominates the herbaceous understory. Historically, the land has been used for domestic cattle grazing. The area supports a small resident sage-grouse population that has been augmented by the translocation of 60 adult hens from Parker Mountain.

Objectives

- 1) To evaluate the ecological viability of using biological (strategic intensive sheep grazing), mechanical (Dixie and chain harrow), and chemical (Plateau herbicide) treatments to improve sage-grouse brood-rearing habitat on Deadman's Bench, Utah.

- 2) To evaluate the combined effect of mechanical hand-cutting of pinyon (*Pinus spp.*) and juniper (*Juniperus spp.*) trees and the use of cattle grazing (biological manipulation).
- 3) To reduce the dominance of brome grass on the vegetation composition and structure, and improving sage-grouse habitat on Anthro Mountain, Utah.

Methods

On Deadman's Bench, twelve treatment plots were randomly established incorporating three different methods of habitat manipulation (four plots per treatment). The first treatment consisted of a double pass from a Dixie harrow, followed by broadcast seeding of a seed mixture containing sage-grouse preferred forbs and grasses. The second treatment was identical to the first treatment except that a chain harrow was used as the mechanical method of manipulation. The third treatment consisted of the broadcast seeding of the same seed mixture used in the first treatment, but instead of mechanical manipulation, 700 yearling domestic sheep were used to strategically graze sagebrush to reduce canopy cover prior to vegetation green-up in early April. The sheep were confined on the treatment plots by the use of temporary electric fencing (two strands of poly wire) powered by solar and deep-cycle batteries. The goal of all treatments was to reduce canopy cover to an optimum level to stimulate increased forb production to enhance sage-grouse brood-rearing habitat. Control plots were also established for comparison to document the effects of the treatments. Both the mechanically-treated and grazed plots were treated with Plateau herbicide to reduce competition from cheatgrass and halogeton (*Halogeton glomeratus*), and to promote the establishment of desired forbs and grasses.

The sheep used in the grazing treatment were conditioned to eat sagebrush and provided with a corn supplement prior to being introduced into the treatment plots. The sheep were supplemented with corn at the rate of one pound per animal per day to provide additional energy as they adjusted to increased levels of terpenes in their diet because of their intake of sagebrush. The sheep were bedded on the treatment sites. The sheep were held 3-4 days on each site. The sheep were daily herded to a nearby water source and then bedded down on the plots at night.

On Deadman's Bench, nutrient content (i.e., protein and nitrogen) of sagebrush, one selected native grass species, and also one native forb species will be analyzed to determine if nutrient content differs in treatment areas (sheep and Dixie harrow) and controls.

On Anthro Mountain, pinyon-pine and juniper trees were hand-cut to reduce the competition of these woody species with herbaceous understory plants. Four random plots were established in larger treatment areas. Cattle grazing was used in an attempt to reduce the dominance of introduced smooth brome grass on four randomly-selected 4-ha plots. Post-treatment vegetation measurements will be recorded on the treatment plots and compared against existing baseline data for the site and controls to determine vegetation response.

Shrub canopy cover was measured using the line intercept method, a technique which involves stretching a tape out for 30 meters and measuring the amount of the live shrub canopy intersected by an imaginary vertical plane that is bisected lengthwise by the tape (Connelly et al. 2003).

Percentages of herbaceous cover (also litter, rock, and bare ground) were estimated using the Daubenmire technique (Daubenmire 1959). A quadrat frame was placed on the ground starting at the one-meter mark along each 30-meter transect, and estimates were recorded. The frame was moved in increments of three meters along each transect with subsequent estimates recorded until the final estimates were taken at the 28-meter mark.

On both Deadman's Bench and Anthro Mountain, sage-grouse pellet surveys were conducted in each plot to evaluate usage by sage-grouse. In each plot, a 100-meter transect was randomly established ten meters in from the plot's boundary with an adjoining untreated area. Each transect was then walked by a team of observers who removed all pre-existing pellets discovered within three meters of the transect. A month later, transects were again walked by a team of observers and all pellets found within three meters of the transects were recorded.

Accomplishments to Date

Deadman's Bench

Initial Sheep Grazing

In January, sheep were introduced into the treatment plots. On the advice of the rancher whose sheep were used, the planned fencing was not installed due to the deep snow cover on the plots. It was believed that the sheep could be held on the plots because of their reluctance to move in the deep snow. It soon became apparent, however, that the sheep were not doing well in the unusually harsh winter conditions, and that the level of sagebrush utilization was not sufficient. As a result, the sheep were pulled from the plots after two weeks.

Resumption of Sheep Grazing

In April, after moderation of climatic conditions, temporary electric fencing was installed as originally planned, and sheep were returned to the plots. Though some difficulties were encountered by delaying the grazing (availability of green grass and a limited water supply), generally good utilization of the sagebrush canopy was achieved.

Vegetation Sampling

In June, vegetation sampling work was conducted on the sixteen plots. Some difficulty was encountered in identifying plant species present due to the general lack of vegetation development. However, we believe we were able to obtain a good representation of species diversity. Presumably, the difficulty we encountered was caused by a delay in plant phenology attributed to the cool spring and extended winter. These data are currently being summarized for analysis.

Vegetation Nutrient Analysis

In July, vegetation samples for nutrient analysis were collected from the Deadman's Bench plots. Two samples each of sagebrush (*A. tridentata ssp. wyomingensis*), as well as of the selected grass (*Elymus elymoides*) and forb (*Sphaeralcea coccinea*) species were collected from each plot. The samples were thoroughly ground and sent to the analytical labs at Utah State University in order to determine nitrogen content.

Sage-grouse Pellet Survey

In July, sage-grouse pellet surveys were conducted. Although few pellets were observed, research being conducted in another study on the mountain indicates the presence of sage-grouse in the area.

2012 Work Plan

Deadman's Bench and Anthro Mountain

Vegetation Sampling

Vegetation sampling work is scheduled for June, 2012, on both Deadman's Bench and Anthro Mountain. Once data collection is completed, statistical analysis will be performed to determine if vegetation diversity, frequency, and abundance may differ by treatment type.

Sage-grouse Pellet Surveys

Sage-grouse pellet surveys will again be conducted on both Deadman's Bench and Anthro Mountain in July, 2012. Statistical analysis will be conducted to determine if a treatment effect is present.

Vegetation Nutrient Analysis

Vegetation samples will again be collected from the Deadman's Bench plots in July, 2012. Statistical analysis will be conducted to determine if a significant difference exists in nutrient content between the sheep and mechanically-treated plots.

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